Reptile Species Richness

These EnviroAtlas national maps display the number of reptile species with potential habitat within each 12-digit hydrologic unit (HUC) in the conterminous United States. These data are based on habitat models rather than wildlife counts.

Why are reptile species important?

Reptile species richness estimates the number of reptile species that may inhabit an area based on potential habitat. Across the U.S., the numbers of reptile species decline from a high of over 70 species in subtropical and desert ecosystems to 11 or fewer species in the northern tier of states (e.g., Minnesota, North Dakota, and Montana). Reptiles are cold-blooded animals with no internal temperature regulation. In cold climates with short summers, reptiles have difficulty not only surviving the winter season but completing essential life functions like mating and reproduction.

Species richness is one measure of biodiversity that can represent the relative conservation value of a particular area. Many scientists believe that biodiversity, because it represents all forms of life on earth, provides the core benefits that humans derive from their environment to help sustain human society, economy, health, and well-being. Managing for biodiversity is one way to balance competing demands for ecosystem services.[1]

Reptile species include turtles, snakes, lizards, and alligators—a diverse group of vertebrate species that plays a vital role in ecosystem health. They are an integral part of the food web, acting as both predators and prey species. The removal of even one species from an ecosystem can create a trophic cascade that can affect the entire food chain. Many reptiles feed on pests such as insects and rodents, which helps to limit damage to plants and cultivated crops. Herbivorous reptiles can be important seed dispersers and pollinators. Some reptiles, such as the gopher tortoise and alligator, may be keystone species in their respective habitats.

Reptile species can be important to human health and the development of pharmaceuticals. For example, substances taken from snakes have been used to develop antimicrobials, anticoagulants, and painkillers, as well as drugs to treat hypertension and high cholesterol.[2] Maintaining the diversity and richness of reptiles allows for the possible future discovery of more valuable treatments.

Photo: Agassiz desert tortoise, K. Nussear, USGS

Reptiles are also economically and culturally important. Many people enjoy simply viewing reptiles in their natural habitats. However, reptile numbers have been reduced by development, road kill, habitat loss, predation, and pesticides. The U.S. Fish and Wildlife Service lists 32 terrestrial reptile species (plus 8 sea turtle species) as threatened or endangered in the lower 48 states. Two of the more prominent threatened reptile species are tortoises—the gopher tortoise in the Southeast and the desert tortoise in the Southwest.[3]

How can I use this information?

Three EnviroAtlas maps, Mean, Maximum, and Normalized Index of Biodiversity (NIB), illustrate Reptile Species Richness within each 12-digit HUC across the conterminous United States.[4] Used together or independently, these maps can help identify areas of potentially low or high reptile species richness to help inform decisions about resource restoration, use, and conservation. Mean richness is a commonly used and understood value for comparison. NIB provides an index to compare a metric with other metrics across multiple project scales simultaneously. Maximum richness identifies areas that are species rich but may not occupy large areas (e.g. linear riparian areas).

These maps can be used in conjunction with other EnviroAtlas maps such as ecoregions, the U.S. Geological Survey (USGS) protected areas database (PAD-US), or the USGS Gap Analysis Project (GAP) ecological systems to identify areas with high ecological or recreational value for conservation, recreation, or restoration planning. Connectivity planning is also important for reptiles because their life cycles often

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require traveling between upland and wetland habitats. After learning the reptile species richness values for a particular 12-digit HUC (click on a HUC area to see the popup), users can investigate an area more intensively by increasing the transparency to view the aerial imagery beneath. Individual species models are also available from the GAP project.

How were the data for this map created?

The USGS GAP project maps the distribution of natural vegetation communities and potential habitat for individual terrestrial vertebrate species. These models use environmental variables (e.g., land cover, elevation, and distance to water) to predict habitat for each species. GAP modeled habitat for 322 reptile species that reside, breed, or use the habitat within the conterminous U.S. for a significant portion of their life history.

The mean and maximum numbers of reptile species in each 30-meter pixel were calculated for each 12-digit HUC across the U.S. The mean species richness value by HUC was divided by the maximum mean value within all HUCs to calculate the NIB.

What are the limitations of these data?

EnviroAtlas uses the best data available, but there are still limitations associated with these data. The data, based on models and large national geospatial databases, are estimations of reality that may overestimate actual reptile species presence. Modeled data are intended to complement rather than replace monitoring data. Habitat models do not predict the actual occurrence of species, but rather their potential occurrence based on their known associations with certain habitat types. Habitat is only one factor that determines the actual presence of a species. Other factors include habitat quality, predators, prey, competing species, and fine scale habitat features.

Other essential species information in addition to species richness includes the types of species and their functional groups, whether they are rare or common, native or non-native, tolerant or intolerant of disturbance. It is also important to consider that species numbers (at a landscape scale) tend to increase with moderate disturbance, meaning that moderately human-altered or disturbed habitats have higher numbers of species than either minimally disturbed or highly disturbed sites.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. Individual 30-meter pixel data may be downloaded from the New Mexico State University Center for Applied Spatial Ecology.

Where can I get more information?

A selection of resources related to reptiles and biodiversity is listed below. Information on the models and data used in the USGS Core Science Analytics, Synthesis & Library's GAP project is available on their website. For additional information on how the data were created, access the metadata for the data layer from the layer list drop down menu. To ask specific questions about this data layer, please contact the EnviroAtlas Team.

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Selected Publications

1. Boykin, K.G., W.G. Kepner, D.F. Bradford, R.K. Guy, D.A. Kopp, A. Leimer, E. Samson, F. East, A. Neale, and K. Gergely. 2013. A national approach for mapping and quantifying habitat-based biodiversity metrics across multiple spatial scales. *Ecological Indicators* 33:139–147.

2. 4. Shaw, C. 2009. Advancing drug discovery with reptile and amphibian venom peptides: Venom-based medicines. *Biochemist* 31(5):34–37.

3. U.S. Fish and Wildlife Service. 2020. U.S. endangered species: Reptiles. Accessed April 2020.

4. Kepner, W.G., K.G. Boykin, D.F. Bradford, A.C. Neale, A.K. Leimer, and K.J. Gergely. 2013. Biodiversity metrics fact sheet, EPA/600/F-11/006, U.S. Environmental Protection Agency, Washington, D.C.